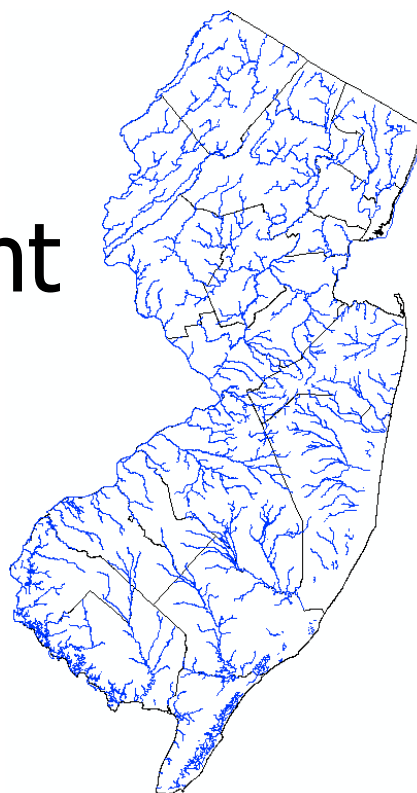




New Jersey Department of
Environmental Protection

Habitat Assessment Manual



A guide to filling out the NJDEP Volunteer Habitat Monitoring Assessment

Visit us on the web for more info @
<http://www.state.nj.us/dep/wms/bwqsa/vm/>

Table of Contents

Background on the NJDEP Volunteer Monitoring Program.....	4
Before Heading into the Field.....	4
Suggested Equipment List	
Filling out your Monitoring Packet.....	5
Page 1: The General Sheet	
Page 2: The Land Use Assessment Sheet	
Page 2: Site Sketch	
Page 3: Scored Monitoring	
Page 5: The Pipe/Drainage Ditch Inventory Sheet	
General Monitoring Sheet.....	5-10
Site Name and Site ID	
Watershed Management Area & County	
Segment Identification	
Survey Team, Activity Time & Date	
Weather Conditions & Temperature	
Water Conditions: Odor, Turbidity, Surface Coating, & Flow	
Stream Measurements: Width, Depth, & Velocity	
Stream Characteristics: Tree Canopy Cover, Woody Debris, Predominant Aquatic Vegetation, Algae Growth and Type, Litter Concentration and Structures	
Land Use Form.....	11
Streamside Land Use	
Other Observations	
Site Sketch.....	12
Scored Monitoring Sheet.....	13-17
Epifaunal Substrate Available Cover	
Pool Substrate Characterization – Low Gradient ONLY	
Embeddedness – High Gradient ONLY	
Depth/Velocity Combinations – High Gradient ONLY	
Pool Variability– Low Gradient ONLY	

Sediment Deposition	
Channel Flow Status	
Channel Alteration	
Scored Monitoring Sheet (continued).....	17-19
Channel Sinuosity – Low Gradient ONLY	
Frequency of Riffles – High Gradient ONLY	
Bank Stability	
Bank Vegetative Protection	
Riparian Vegetation	
Habitat Score	
Pipe Inventory Sheet.....	20
Outfall Pipe Reference #	
Pipe Location	
Pipe Type, Diameter, and Material	
Pipe Flow/Appearance	
Appendices.....	21-33
Glossary	
Didymo Decontamination Procedure	
High Gradient and Low Gradient Habitat Assessment Sheets	

Background on the DEP Volunteer Monitoring Program



The NJDEP and other stakeholders across New Jersey have been utilizing the help of volunteers to collect valuable data on surface water quality and watershed health. Volunteer water monitors are of vital importance to the continuation of monitoring efforts throughout the state.

NJDEP's Volunteer Monitoring Program and the Watershed Watch Network are coordinated within Water Monitoring & Standards' Bureau of Environmental Assessment, Restoration and Standards. The Watershed Watch Network acts as an umbrella for the volunteer monitoring programs in New Jersey.



Before Heading into the Field



NJDEP is not liable for any event that occurs during monitoring.

1. Determine if it's the right time of year for monitoring, especially if you plan to enter the stream.

-Best times are spring, summer, and fall

-Worst times are drought, extreme summer days and during flooding and after storm event

-Do not sample during cold winter months

2. Confirm the location and time with your sampling partner. **Always monitor with another person.**

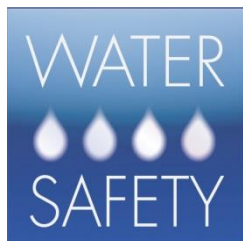
3. Check to make sure you have all of your equipment before heading into the field.

Suggested Equipment List

- ✓ Data Sheets
- ✓ Clip Board and Pen/Pencil
- ✓ Measuring Tape
- ✓ Meter Stick
- ✓ Floatable Rubber Ducky
- ✓ Proper Attire
 - Waders, Boots, Long Sleeves, Safety vest
- ✓ Water Bottle



- ✓ GPS/Smartphone
- ✓ Whistle
- ✓ Sunscreen, Bug Repellent
- ✓ First Aid Kit



IMPORTANT:

A WADABLE stream is one that you can safely enter and stand. The water level should be no more than thigh high.

A NON-WADABLE stream is a stream in which the current is moving too fast or the depth of the stream is unsafe for you to walk in. You can assess the stream from a bridge, road crossing or streambank.

In high-flow or icy conditions, or if the stream is just not accessible, you can perform a NON-WADABLE assessment. This means that you will estimate the width of the stream and you will not take velocity, depth or water temperature measurement.

DIDYMO (Rock Snot) DECONTAMINATION

Treat all streams like they have Didymo, not just ones that have been confirmed.

Didymo is not visible to the naked eye at first and by the time you see it, it is too late.

When collecting macroinvertebrates from the stream, return them back to the same stream and the same location. No mixing samples.

If you want to do more than one assessment in a day you should only work on one stream per day. Start upstream and work downstream when changing locations (following how the river flows), to avoid contaminating any upstream locations that have not been exposed to Didymo.

You should be clean your equipment after each day in same stream or in between sampling events on different streams.

You must decontaminate all small equipment (e.g., buckets, nets, water sampling equipment) AND Personal Protective Equipment (e.g., rain gear, gloves, boots, waders and PFDs)

1. Remove all organic material from gear
2. Fill bucket with Alconox and stream water and place all equipment in the tub.
3. Scrub small and personal protective equipment.
4. Rinse or let dry completely

Filling out your Monitoring Packet

Note: There are two sheets that may be used, **HIGH GRADIENT** or **LOW GRADIENT**

Each time you go out into the field to begin a habitat assessment, make sure to have all 5 pages of your monitoring packet; General, Site Sketch, Scored Monitoring, Land Use, and Pipe & Drainage.

Fill out all sections in the field.

Page 1: The General Sheet

The *General Sheet* is used to determine a wide range of information such as stream characteristics, location of the assessment access point, current weather conditions and stream name. This section should be completed after the entire stream-reach has been walked. To properly identify the exact coordinates of each site, we recommend using a Smartphone GPS app as described in the appendix. Also, free online tools like NJ GeoWeb or Google maps can be used, as well as using ArcGIS.

Page 2: Land Use

The *Land Use* page is meant to provide general information about the surrounding watershed. Make sure to consider any land use within view of your monitoring location that may influence stream habitat. Land use data collected on this sheet is extremely useful to water quality data users within the NJDEP because it allows streamside land use to be assessed more frequently.

Page 2: Site Sketch

Each *Site Sketch* ensures that we understand physical characteristics of the stream and the land use surrounding the immediate monitoring location. While sketching the site, keep in mind the importance of adding reference points such as road names or GPS points to the map. Add anything note-worthy in and around the stream such as flow direction, riffles, pools, runs, debris, outfalls, riprap, etc.

Page 3: Scored Monitoring

The *Scored Monitoring* sheet collects detailed information about the physical parameters of each stream. Depending on the location of the stream, either the high gradient or low gradient form will be used. This section scores parameters individually from 1 to 10 or 1 to 20 and identifies a rating of optimal, suboptimal, marginal, and poor. After completing this section, determine the total score.

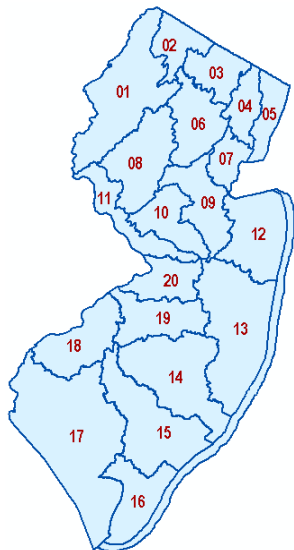
Page 5: The Pipe/Drainage Ditch Inventory Sheet

The *Pipe Ditch Inventory* is used if a drainage ditch or pipe is encountered while conducting an assessment. The data collected helps us to determine point and non-point sources of pollution that may be entering the stream. Each pipe should be geospatially located for potential follow-up at that location and identified on site sketch.

General Sheet

Site Name and Site ID

Site Name: This is a unique name that you will give each site. The name you select should be descriptive and include the local name for the water body. Example, if you are going to a site on the Passaic River, your site name can be "Passaic River at intersection of Rt. 3 and Board St."



Site ID: The Site ID starts with WA (Watershed Ambassador) followed by the closest AMNET site or USGS station. Example: WA0689. Multiple assessments at the same AMNET location can be identified using a, b, c as you move upstream. Example: WA0689a. If there are no AMNET or USGS sites at the location and no other sites have been created by previous Ambassadors (you will need to check on NJ GeoWeb or ArcGIS before you go out in the field), you will use the first 4 letters of the stream. Example: Passaic River will be WAPASS. If the stream is named "Passaic Tributary", you can use WAPASSTRIB. If you are conducting multiple assessments you can use 1, 2, 3 as you move upstream. Example: WAPASS1.

Watershed Management Area & County

WMA: This refers to one of the 20 **W**atershed **M**anagement **A**reas identified by the Department. See the attached map or NJ GeoWeb/ArcGIS for this information.

County: The name of the county you are doing the assessment in.

Segment Identification

The stream segment you are assessing should be 100 meters (328 feet).

Latitude/Longitude: Take a GPS point at the starting point of your assessment

Estimate of Segment Length: Estimate the length of the reach (aim for 100m)

Record the Latitude and Longitude on your data sheet. You can also check accuracy of GPS points by identifying the latitude and longitude on a USGS topographic map, NJ GeoWeb, ArcGIS or Google maps.

Survey Team, Activity Time & Date

Survey Team: Record the names of the people involved in the assessment.

Activity Time & Date: Record the date and time when the assessment was performed.

Current Weather, Days Since Last Rain, & Temperature

Current Weather: Check the one that best describes the weather conditions on the day of the assessment

Days Since Last Rain:

Weather can affect assessment interpretation, so it is important to record recent rainfall or drought conditions. Record the number of days since the last rainfall in the space provided. You can also check the volunteer weather monitoring site at <http://www.cocorahs.org/> or visit the National Weather Service at <http://water.weather.gov>

Current Temperature: Enter the air and water temperature in °C. If you need to convert Fahrenheit to Celsius use the Converter at <http://www.wbuf.noaa.gov/tempfc.htm>

Water Conditions: Odor, Turbidity, Surface Coating & Flow

Odor

The odor of the stream will be dependent upon many things such as the time of year. Circle the option that best describes the general water odor along the stream.

Turbidity

Turbidity is the measure of total suspended solids in the water causing a decrease in clarity. Keep in mind that the natural color of the stream will be dependent upon what region you are assessing. For example,

tea colored water in the pinelands does not mean high turbidity. Circle the option that best describes the turbidity of your stretch of stream.

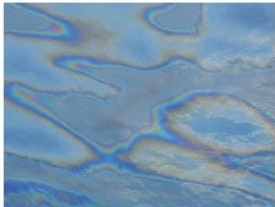
Surface Coating

Determine if there is a coating on the surface of the water. Circle the option that best describes the surface coating you see in your stretch of stream.



Hints-

Foam: Foam can also be naturally occurring. One way to help determine if it is natural foam or petroleum-based foam (usually soap or detergent) is by looking closely at the bubbles within the foam. If the bubbles have a noticeable iridescent look to them, it is likely to be petroleum based.



Oil: An oily sheen can be naturally occurring or petroleum-based. To determine the type of sheen, move the surface water around with a stick or throw a rock into it. If the oily coating is natural, it will break up and look like puzzle pieces and will not float back together. If the oily coating is petroleum-based, it will break up but then quickly move back together.



Pollen Coating: A coating of pollen on the surface of the water.

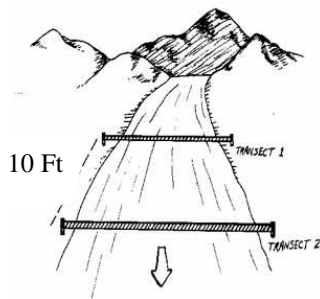
Stream Flow

Consider the whole 100 meter stretch to determine how the stream appears to be flowing.

Circle the option that best identifies the reach.

1. Slow means that when looking at the stream the water does not appear to be moving or is barely moving.
2. Moderate means that when looking at the stream, the water appears to be moving but the surface still appears flat.
3. Swift means that the water is moving fast and the surface of the water is not flat.
4. Combination means that the flow in the reach varies because the reach is made up of pools and riffles and/or constrictions that are causing small pooling of water.

Transect Measurements (Width, Depth & Velocity)



Using your flags, mark off a **10 foot** section of stream that is representative of your stream reach. Within this section, you will be measuring width, depth and calculating velocity.

Stream Width

Take 1 measurement within the 10 foot section and record the measurement on the data sheet. Measure width from water's edge to water's edge.

Stream Depth

Take 5 depth measurements in your 10 foot section along the width transect. You should measure at least every foot for smaller streams and every five feet for wider streams. Calculate the average of the measurements and record it on your data sheet.

Stream Velocity



With a stopwatch, measure the time it takes your rubber duck to float the 10 feet section. Repeat 5 times using the same floating tool, in the same 10-foot section and record each time on your data sheet. Then average the 5 times to determine the average time. Divide the distance ($D = 10$ feet) by the average time (T) to determine velocity in feet per second ($V = D/T$). Record this on your data sheet.

Tree Canopy Cover & Woody Debris

Tree Canopy Cover



Stand in the middle of the stream or at the stream's edge and look straight up toward the sky looking over the center of the stream. In the fall or winter try to visualize how the leaves will look in the summer on the tall overhanging treetops. Some people may find it more useful to look at the reflection of the tree canopy on the stream. Use your best judgment in picking the option that best represents the estimated percentage of stream canopy coverage.

Woody Debris

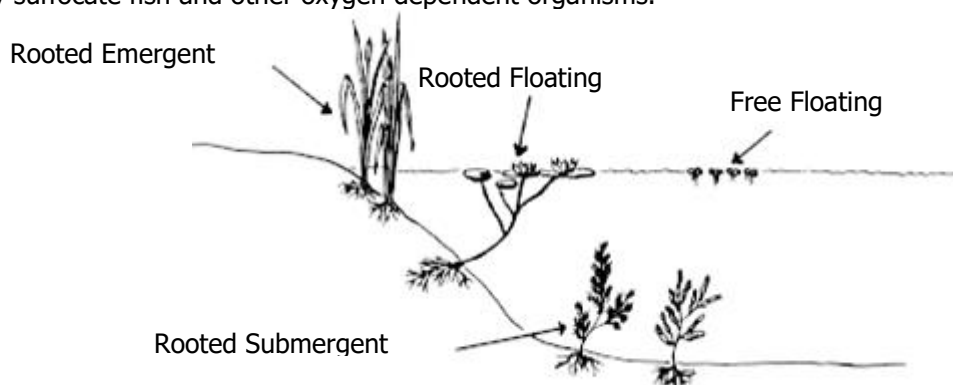
Woody debris includes logs, sticks, and branches and other wood that falls into the stream. Attached woody debris can create in-stream habitat for invertebrates and fish. Streams get a lot of their nutrients from woody debris. However, too much woody debris can negatively impact a stream by slowing down stream flow, by causing a barrier to fish movement or by nutrient overloading. Circle the option that best describes what was observed.

If the debris are free floating, it may have recently floated down stream and is not a useable habitat. However, if the debris is established and attached it will provide habitat for invertebrates and fish.

Predominant Aquatic Vegetation

Predominant Aquatic Vegetation

Aquatic vegetation is important for instream habitat. It provides food and habitat for aquatic life. However, excessive aquatic vegetation affects the health of a stream as plant respiration and decomposition uses dissolved oxygen in the water. If there are too many aquatic plants in the stream it may suffocate fish and other oxygen dependent organisms.



Source: North Central Regional Extension Publication No. 241, Carole A. Lembi, Aquatic Weed Specialist

Circle the option that best describes the predominant aquatic vegetation observed.

1. Rooted Submergent - vegetation is completely underwater
2. Rooted Emergent - vegetation is rooted in substrate and is partially exposed above the water surface
3. Rooted Floating - vegetation is rooted into the substrate and is floating on top of the water surface (an example is a lily pad)
4. Free Floating - vegetation is not rooted or attached to anything
5. None

Algae Growth & Type

Algae Growth

Algae can provide shelter and food resources for fish and macroinvertebrates; however, large populations of algae can limit the amount of oxygen available to organisms.

Algae Type

This refers to the predominate type of algae in the stream.

Filamentous refers to algae that are stringy or cotton like. Filamentous algae are single algae cells that form long visible chains, threads or filaments. These filaments intertwine forming a mat that resembles wet wool. Often filamentous algae floats to the surface forming large mats. This type of algae often appears bulky.

Periphyton is benthic (lives on the stream bottom) algae that grow attached to surfaces such as rocks or larger plants. Periphyton are primary producers and sensitive indicators of environmental change in water bodies.

Litter & Structures



Litter Concentration

Note whether or not you see litter throughout your stream reach. Large litter should be identified in the notes section of your report. Illegal Dumping should be reported using a new mobile application, which can be accessed on smart phones at <https://njwebmap.state.nj.us/DEPStopDumping>

The user reports the illegal dumping location, the size and type of the dump, as well as a picture of the debris. Once the site is reported, DEP investigators will work to find the responsible party. For additional instructions on how to use the mobile application, visit: www.nj.gov/dep/stopdumping/instructions.htm

Structures

Bridges, culverts, weirs and dams are all examples of in-stream, man-made structures that will affect the stream's health. Please mark the structures observed in the stream within the reach. Also identify any other structures observed outside of your stream reach in your site stretch.

Land Use

Streamside Land Use



Go through the list of stream side land uses provided and mark everything that is present within viewing distance of the stream reach you are surveying. If you notice anything unusual or important, make sure to add it to the comments box.

Other Observations

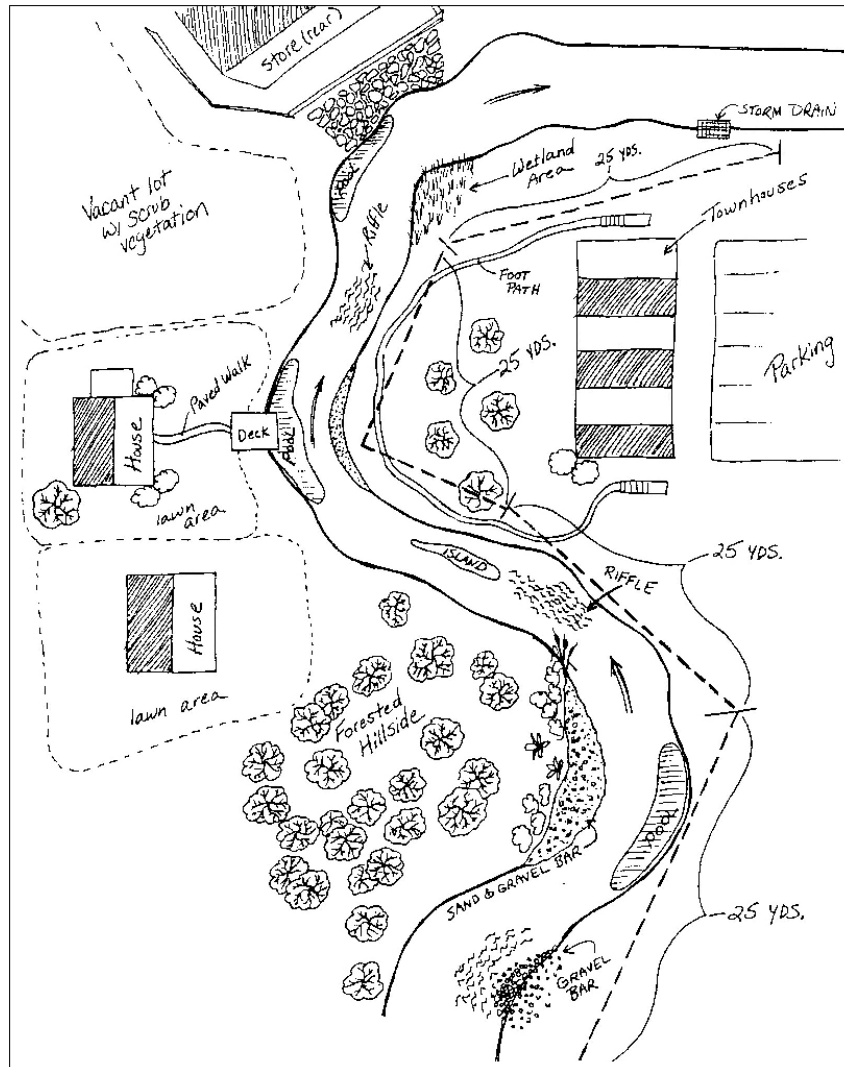


Fill in any other observations made about the reach. This can include wildlife observed, anything that appears out of the ordinary, or information obtained by talking with local residents concerning the history of land use in the area. Observation locations should be marked on the site sketch map.

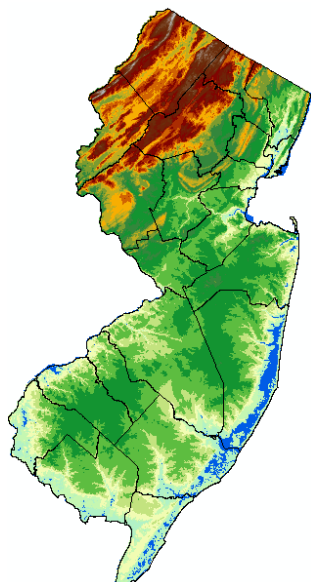
Site Sketch

Site Sketch

This is a hand drawn map of your stream segment. Your map should include such features as pools, riffles, runs, road crossings, transect locations, outfalls, ditches, stream confluences, flocks of waterfowl, etc. Please be sure to include anything you may see along your stream walk. You can scan your sketch in an electronic format or take a photo of your site sketch and submit it with your assessment.



Scored Monitoring



There are two predominate stream types, high gradient and low gradient. You can check GeoWeb under "Physiographic Provinces" to identify each region ie. Valley and Ridge, Highlands, Piedmont, and Coastal Plain.

High gradient indicates a steep slope and rapid flow of water with more ability to erode. High gradient streams are found in areas that have some elevation above sea level like the Valley and Ridge, Highlands or the Piedmont region.

Low gradient indicates a nearly level stream bed and sluggish moving water. Low gradient streams are found in low-lying areas like the Coastal Plains or the Pinelands.

Your monitoring sheet results will vary depending upon your stream gradient status. For example, pool and riffle variability may not be present if you are in a low gradient stream. However, in high gradient streams, pools and riffles may be easily assessable.

Score each parameter on a scale of 1-20 (or 1-10 for Left Bank and Right Bank options) and determine which range the parameter falls into such as optimal, suboptimal, marginal or poor.

After completing this entire section, add up all parameter scores to determine the health of the entire stream reach.

Epifaunal Substrate/Available Cover

* Description is different due to high and low gradient regions.

Includes the relative quantity and variety of natural structures in the stream, such as cobble (riffles), large rocks, fallen trees, logs and branches, and undercut banks, available as refugia, feeding, or sites for spawning and nursery functions of aquatic macrofauna. A wide variety and/or abundance of submerged structures in the stream provides macroinvertebrates with a large number of niches, thus increasing habitat diversity. As variety and abundance of cover decreases, habitat structure becomes monotonous, diversity decreases, and the potential for recovery following disturbance decreases. Riffles and runs are critical for maintaining a variety and abundance of insects in most high-gradient streams. The extent and quality of the riffle is an important factor in the support of a healthy biological condition in high-gradient streams. Riffles and runs offer a diversity of habitat through variety of particle size, and, in many small high-gradient streams, will provide the most stable habitat. Snags and submerged logs are among the most productive habitat structure for macroinvertebrate colonization in low-gradient streams. However, "new fall" will not yet be suitable for colonization.

High Gradient Stream

1. Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).

2. 40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).
3. 20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.
4. Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.

Low Gradient Stream

1. Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).
2. 30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).
3. 10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.
4. 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.

Pool Substrate Characterization – Low Gradient ONLY

Pool substrate characterization evaluates the types of substrates and the conditions of pools within a stream. Firmer sediment types (e.g., gravel, sand) and rooted aquatic plants support a wider variety of organisms than a pool substrate dominated by mud or bedrock and no plants. In addition, a stream that has a uniform substrate in it's pools will support fewer types of organisms than a stream that has a variety of substrate types. Substrate characterization should be determined based on the range of substrates you find in each pool; hard-pan clay, bedrock, mud, silt, organic matter, etc.

Embeddedness – High Gradient ONLY

Refers to the extent to which rocks (gravel, cobble, and boulders) and snags are covered or sunken into the silt, sand, or mud of the stream bottom. Generally, as rocks become embedded, the surface area available to macroinvertebrates is decreased. Embeddedness is a result of large-scale sediment movement and deposition, and is a parameter evaluated in the riffles and runs of high-gradient streams. The rating of this parameter may be variable depending on where the observations are taken. To estimate embeddedness, observe the amount of fine particles overlying, in between and surrounding the rocks in the bottom of the stream.



1. Gravel, cobble and boulders are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.
2. Gravel, cobble and boulders are 26-50% surrounded by fine sediment.

3. Gravel, cobble and boulders are 51-75% surrounded by fine sediment.
4. Gravel, cobble and boulders are 76% or greater surrounded by fine sediment.

Velocity/Depth Combinations– High Gradient ONLY

Stream velocity and depth can greatly affect the aquatic life of a stream. The best available habitat includes all of the following combinations of velocity and depth combinations. The occurrence of these 4 patterns relates to the stream's ability to provide and maintain a stable aquatic environment. Record all available combinations for both wadable and non-wadable streams.

Pool Variability– Low Gradient ONLY

The overall mixture of pool types found in streams, according to size and depth. The 4 types of pools are large-shallow, large-deep, small-shallow and small-deep. A stream with many pool types will support a wide variety of aquatic species. Rivers with low sinuosity (few bends) and monotonous pool characteristics do not have sufficient quantities and types of habitat to support a diverse aquatic community. General guidelines are any pool dimension (i.e., length, width, oblique) greater than half the cross-section of the stream for separating large from small and 1 m depth separating shallow and deep.

1. Even mix of large-shallow, large-deep, small-shallow, small-deep pools present
2. Majority of pools large-deep; very few shallow
3. Shallow pools much more prevalent than deep pools
4. Majority of pools small-shallow or pools absent

Sediment Deposition

* Description may be different depending on if you are located within a high gradient or low gradient region.

Measures the amount of sediment that has accumulated in pools and the changes that have occurred to the stream bottom as a result of deposition. Deposition occurs from large-scale movement of sediment. Sediment deposition may cause the formation of islands, point bars (areas of increased deposition usually at the beginning of a meander that increase in size as the channel is diverted toward the outer bank) or shoals, or result in the filling of runs and pools. Usually deposition is evident in areas that are obstructed by natural or manmade debris and areas where the stream flow decreases, such as bends. High levels of sediment deposition are symptoms of an unstable and continually changing environment that becomes unsuitable for many organisms.

High Gradient Streams

1. Little or no enlargement of islands or point bars and less than 5% of bottom affected by sediment deposition.
2. Some new increase in bar formation, mostly from gravel, sand or fine sediment: 5-30% of the bottom affected, slight deposition in pools.
3. Moderate deposition of new gravel, sand or fine sediment on old or new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.
4. Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition

Low Gradient Streams

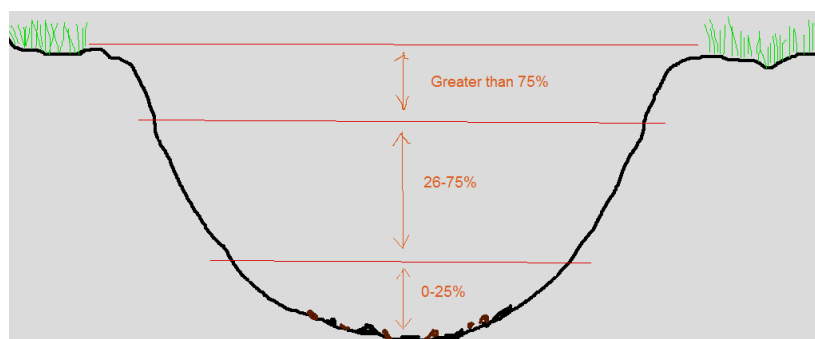
1. Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.
2. Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.
3. Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.
4. Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition

Channel Flow Status

The channel flow status is the amount of water in the channel. The flow status will change as the channel enlarges (e.g., widening caused by erosion) or as flow decreases as a result of dams and other obstructions, diversion of flow, dry weather conditions or drought.

1. **Base of both lower banks**
Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.
2. **Greater than 75%**
Water fills >75% of the available channel; or <25% of channel substrate is exposed.
3. **25-75%**
Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.
4. **Very little water**
Very little water in channel and mostly present as standing pools.

In high-gradient streams, riffle areas and cobble substrate can be exposed; in low-gradient streams, the decrease in water level exposes logs and snags and reduces the areas of good habitat for aquatic organisms. Channel flow is especially useful for interpreting biological condition under abnormal or lowered flow conditions.



Channel Alteration

Channel alteration is any changes in the shape of the stream channel. Many streams in urban and agricultural areas have been straightened, deepened, or diverted into concrete channels, often for flood control or irrigation purposes. Such streams have fewer natural habitats for fish, macroinvertebrates, and plants than do naturally meandering streams. Signs of channelization, or straightening of the stream,

may include an unnaturally straight section of a stream, high banks, lack of flow diversity (pools, riffles, runs), uniform-sized stream substrate, lack of vegetation diversity, and absence of vegetation.

1. Stream with normal pattern
2. Some channelization present, usually in areas of bridges etc.
3. Channelization extensive, 40-80% of the streams reach
4. Over 80% of the stream channelized, gabion baskets and/or riprap, and/or concrete present



Channel Sinuosity – Low Gradient ONLY

Sinuosity refers to the natural tendency for a stream to meander. A high degree of sinuosity provides for diverse habitat and fauna, and can better handle increased flow when the stream level fluctuates as a result of storms. Meandering allows for the absorption of the energy of moving water and protects the stream from excessive erosion and flooding and provides refuge for benthic invertebrates and fish during storm events. For purposes of measuring sinuosity, volunteers may want to consider a

longer segment or reach when evaluating this parameter.

1. Sharp bends (oxbows): The bends increase the stream length by 3-4 times compared to if it was in a straight line.
2. Moderate bends: The bends in the stream increase the stream length by 2-3 times compared to if it was in a straight line
3. Slight bends: The bends in the stream increase the stream length by 1-2 times compared to if it was in a straight line.
4. Straight-channelized: the channel is straight and has obviously been channelized with an artificial lining or bank stabilization.

Frequency of Riffles – High Gradient ONLY

Riffles are shallower depth areas of the stream segment with faster, turbulent water running over gravel and/or rocks. The frequency of riffles refers to the heterogeneity occurring in a stream. Riffles are a source of high-quality habitat and diverse fauna, therefore, an increased frequency of occurrence enhances the diversity of the stream community. In headwaters, riffles are usually continuous and the presence of cascades or boulders provides a form of sinuosity and enhances the structure of the stream.

1. Occurrence of riffles relatively frequent; distance between riffles is 5-7 times stream width. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.
2. Occurrence of riffles infrequent; distance between riffles is 7 to 15 times stream width.
3. Occasional riffle or bend; bottom contours provide some habitat; distance between riffles is 15 to 25 times stream width.
4. Generally all flat water or shallow riffles; poor habitat; distance between riffles is >25 times stream width

Bank Stability

*Note: Be sure to score both Left and Right Banks - left and right bank are determined by looking up stream.



Bank Stability refers to the existence of or the potential for detachment of soil from the stream banks and its movement into a stream. Excessive bank erosion occurs when the watershed surrounding the stream has been altered. Signs of erosion may include exposed tree roots, undercut banks, unvegetated banks and exposed soil. Eroded banks indicate a problem of sediment movement and deposition, and suggest a scarcity of cover and organic input to streams.

1. Stable: Evidence of erosion or bank failure absent or minimal; <5% of bank affected.
2. Moderately Stable: Small areas of erosion, mostly healed over; 5-30% of bank in reach has areas of erosion.
3. Moderately Unstable: 31-60% of bank in reach has areas of erosion, high erosion potential during flooding.
4. Unstable: Many eroded areas, bald areas frequent; obvious bank sloughing; 60% or more of bank shows erosion scars.

Bank Vegetative Protection

* Note: Be sure to score both Left and Right Banks- left and right bank are determined by looking up stream.

Bank Vegetative Protection is the vegetation protecting the stream's banks and the near-stream portion of the riparian zone. The root systems of plants growing on stream banks help hold the soil in place, thereby reducing the amount of erosion that is likely to occur. Banks that have full, natural plant growth are better for fish and macroinvertebrates than are banks without vegetative protection.

Looking upstream evaluate how much of the stream bank is covered by vegetation.

1. Greater than 90% of the streambank surfaces and immediate riparian zones covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.
2. 70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.
3. 50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.
4. Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.

Riparian Vegetation

This quantifies the width of the riparian zone. It is the measure of natural vegetation from the edge of the stream bank out through the riparian zone. The vegetative zone serves as a buffer to pollutants entering a stream from runoff, controls erosion, and provides habitat and nutrient input into the stream. A relatively undisturbed riparian zone supports in stream habitat; narrow riparian zones occur when roads, parking lots, fields, lawns, bare soil, rocks, or buildings are near the stream bank. Natural vegetation should consist of a good mix of plants including grasses, forbs, shrubs, understory trees and large trees. Again, left and right bank is determined by looking up stream.

1. Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.
2. Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.
3. Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.
4. Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.

Habitat Score

In order to fully understand the health of the stream reach add up all of the scores of each habitat parameter. After totaling you will receive one of the following scores.

Optimal: 160-200

Sub-Optimal: 110-159

Marginal: 60-109

Poor: <60

Pipe & Inventory



Pipe Information

Latitude and Longitude

Take a GPS point where the pipe discharges into the stream

NJPDES #- if applicable

If the pipe has a permit number posted on it or near it, record that number in the space provided.

Pipe Diameter

Enter the estimated diameter or measure the diameter of the pipe.

Type

Circle the best description for the type of discharge from the pipe.

1. Storm Drain Discharge is from storm sewers in adjacent developments or highway/road systems.
2. Residential Discharge is a pipe from a nearby home discharging water from a sump, drain or washer.

3. Industrial Discharge (NJPDES#) means a permitted industrial discharge. These discharges will be clearly marked in the field and should be identified prior to going out. The NJPDES permit number should be recorded here.

4. Combined Sewer Overflows are sewer systems that carries both sewage and stormwater runoff during rain events. Normally, its entire flow goes to a waste water treatment plant, but during a heavy storm, the volume of water may be so great as to cause overflows of untreated mixtures of stormwater and sewage into receiving waters.

5. Other is any other discharge that you observe whether or not you can identify the specific type.

Pipe Material

In most cases you will find a pipe made from one of the following materials

Pipe Location

Circle the option that best describes the location of the pipe in relation to the stream bank.

1. In Water-the end of the discharge pipe is located at the bottom of the stream bank or in the channel.

2. In Bank-the discharge pipe is coming out of the stream bank

3. Near Water -discharge pipe is located at or slightly behind the top bank and discharges down the bank.

Pipe Flow/Appearance

Circle the option that best describes the flow coming out of the pipe.

Is the stream bank at the outfall eroded?

1. Yes 2. No

Is stream bed eroded downstream?

1. Yes 2. No

Appendices

Glossary

Algae: A chlorophyll-containing plant ranging from one to many cells in size that lives in fresh or salt water.

Baseflow: The portion of stream flow that is derived from groundwater; average stream discharge during low flow conditions.

Benthic (Bottom-dwelling): The plant and animal life whose habitat is the bottom of a sea, lake, or river.

Channelization: Straightening of a stream channel to make water move faster.

Channelized: The straightening and deepening of streams. Channelization reduces the ability of the stream to assimilate waste and disturbs fish breeding areas.

CPOM: Coarse Particulate Organic Matter. Material of plant or animal origin that is suspended in water.

Culvert: A channel used for draining water, often enclosed in steel, concrete, or plastic; can be used to allow water to pass underneath a road or embankment.

Ecosystem: The interacting system of a biological community (plants, animals) and its non-living environment.

Effluent: The wastewater from a municipal or industrial source that is discharged into the water.

Embeddedness: The degree to which objects in the stream bottom are surrounded by sediment.

Erosion: The wearing away of the land surface by wind or water.

Eutrophication: A process where water bodies receive excess nutrients that stimulate excessive plant growth.

Floodplain: The flat area of land adjacent to a stream that is formed by flood processes.

Geospatial: Of or relating to the relative position of things on the earth's surface

Gradient: The slope or steepness of the stream.

Habitat: The natural environment in which a species or group of species lives.

Macrophytes: Aquatic plants, growing in or near water that are either emergent, submergent, or floating.

Macroinvertebrate: Organisms found attached to rocks or within the sediments of the stream bed, often larval stages of insects and are indicative of stream health.

Non-Point Source Pollution: "Diffuse" pollution, generated from large areas with no particular point of pollutant origin, but rather from many individual places. Urban and agricultural areas generate nonpoint source pollutants.

Nutrient: Any substance, such as fertilizer, phosphorus, and nitrogen compounds, which enhances the growth of plants and animals.

Outfall: The outlet or place of discharge of a river, drain, sewer, etc.

Point Source Pollution: A discharge of water pollution to a stream or other body of water, via an identifiable pipe, vent, or culvert.

Pool: An area of relatively deep slow water in a stream that offers shelter to fish.

Quality Assurance (QA): Quality Assurance is the larger system to see that Quality Control (QC) is maintained. QA asks if we are doing the right things (in our case are we monitoring the right things to detect changes in water quality).

Reach: A stream section with fairly similar characteristics.

Riffle: A shallow, gravelly area of streambed with swift current where water is breaking over rocks, wood, or other partly submerged debris and producing surface agitation.

Riprap: A sustaining wall built of rocks.

Riparian Zone: An area, adjacent to and along a watercourse, which is often vegetated and constitutes a buffer zone between the nearby lands and the body of water.

Run: A stretch of fast smooth current, deeper than a riffle.

Runoff: The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually returns to streams. Runoff can pick up pollutants from the air or the land and carry them to streams, lakes, and oceans.

Sediment: Fine soil or mineral particles that settle to the bottom of the water or are suspended in the water.

Stormwater Runoff: Water that washed off the land after a rainstorm. In developed watersheds it flows off of roofs and pavement into storm drains which may feed directly into the stream; often carries concentrated pollutants.

Substrate: The material that makes up the bottom layer of the stream, such as gravel, sand, or bedrock.

Suspended Sediments: Fine material or soil particles that remain suspended by the current until deposited in areas of weaker current. They create turbidity and when deposited, can smother fish eggs or early plant growth.

Topographic: The configuration of a surface area including its relief, or relative elevations, and the position of its natural and man-made features.

2015-2016

Turbidity: Cloudiness of the water, caused by suspended sediments or excess organic matter.

Vegetation: All the plants or plant life of a place, taken as a whole